Working with Rasters and Imagery using Python

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Imagery Data in ArcGIS

- **ArcGIS supports imagery data management from various sources**
  - **Over 100 native image formats**
  - **Over 60 different sensors supported**
    - **Satellite**
    - **Aerial cameras**
    - **UAV/UAS cameras**
    - **Multidimensional data NetCDF/GRIB/HDF**

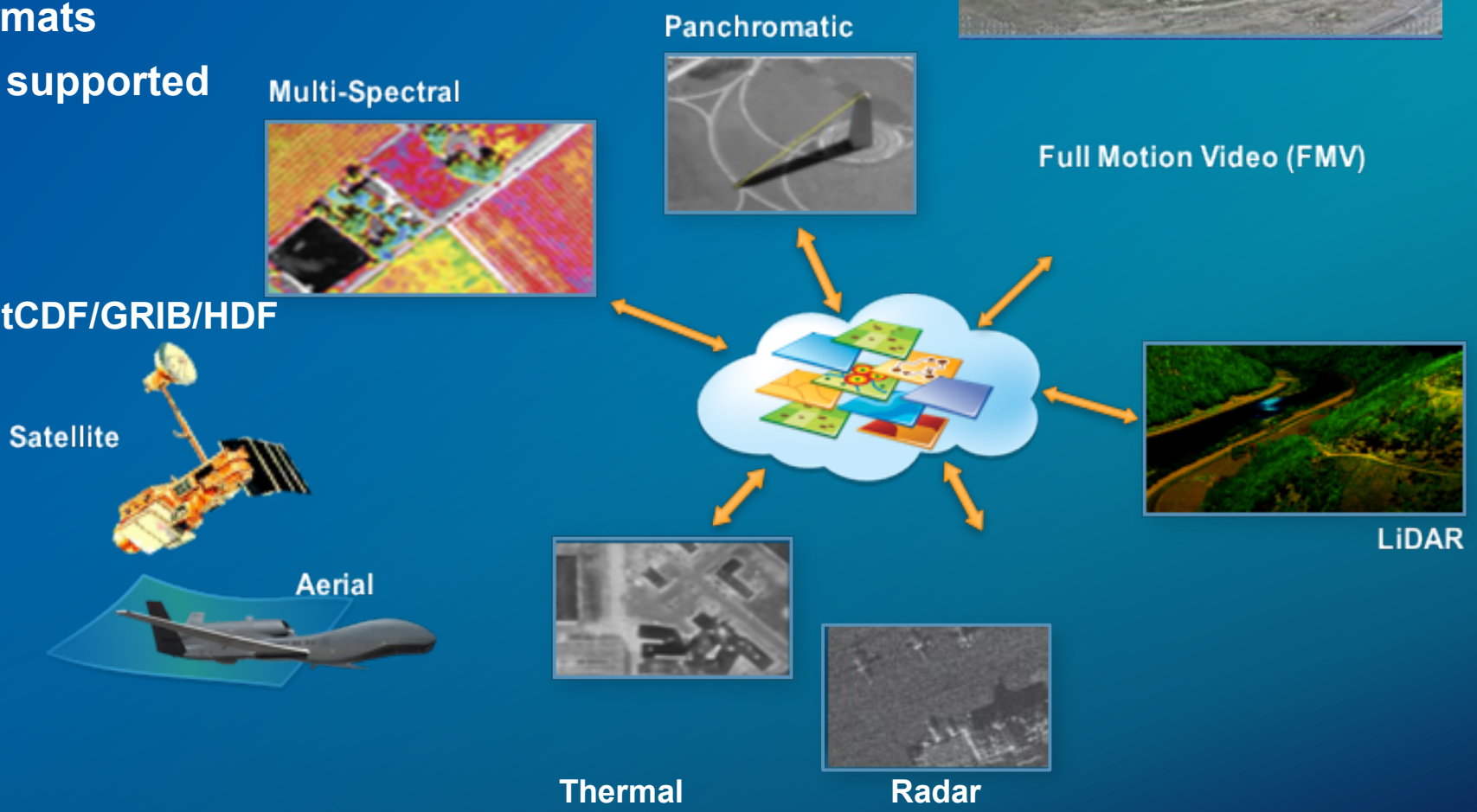
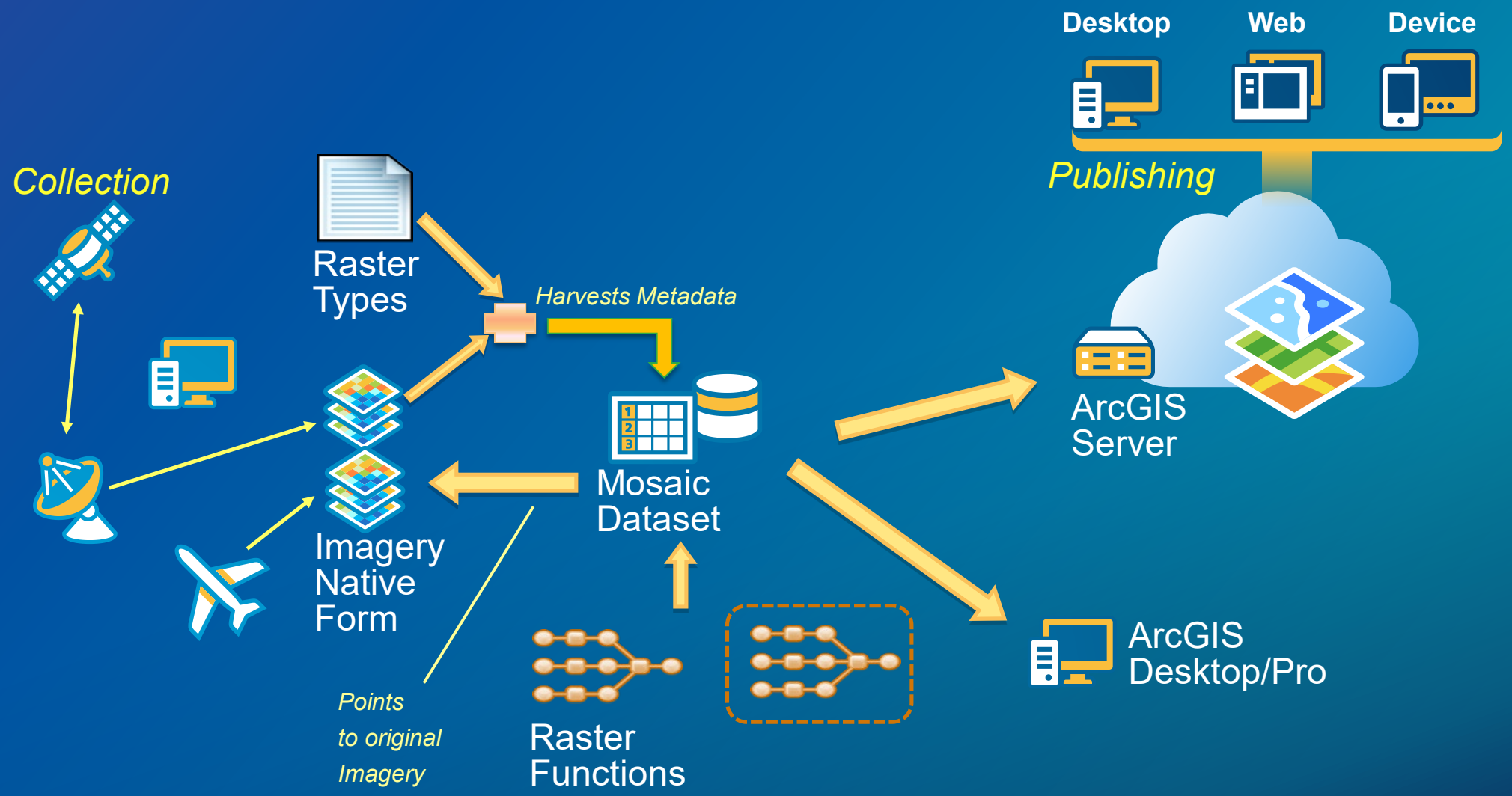
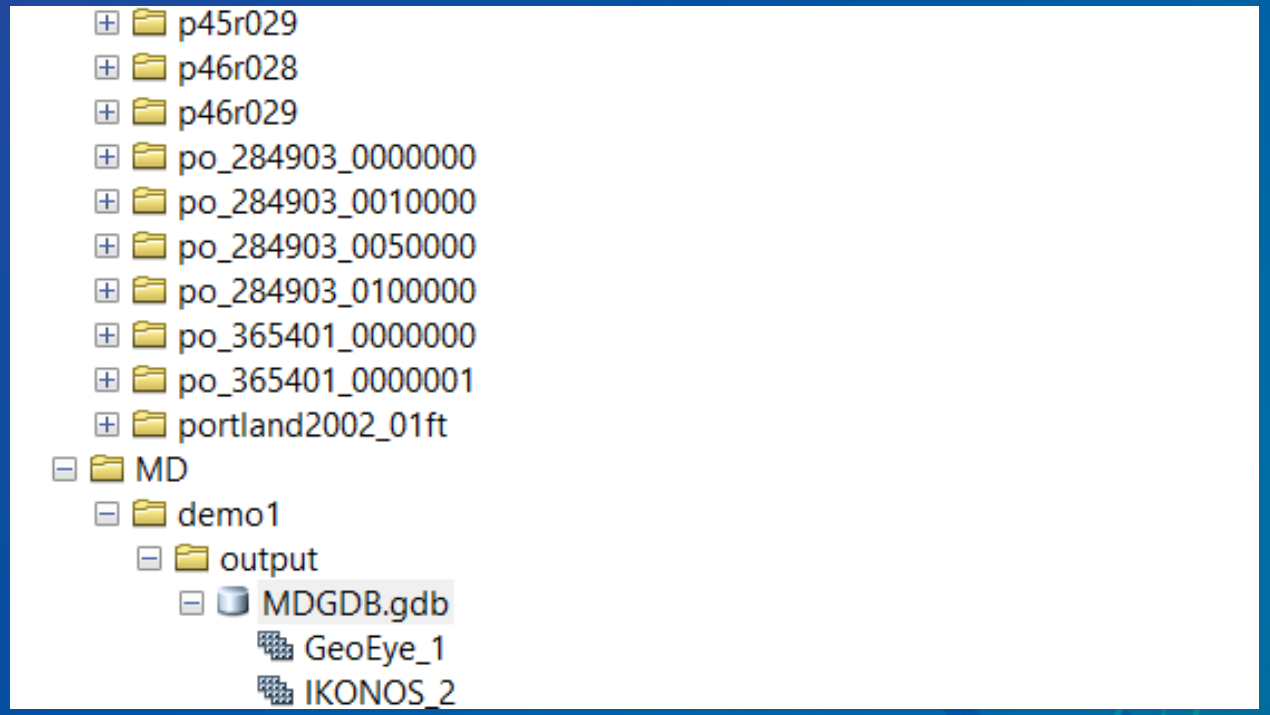


Image Management using Mosaic Dataset

- **ArcGIS provides image collection management solution through Mosaic Dataset**
  - **Create mosaic dataset in supported geodatabase**
    - **File geodatabase**
    - **Enterprise geodatabase (Oracle/PostgreSQL/SQL Server e.t.c)**
  - **Providing a catalog view of image collection**
  - **Referencing original image source**
  - **Dynamic mosaicking**
  - **Support on-the-fly raster function**
  - **Can be shared as image service through Image Server**

Automate Imagery Management and Sharing Workflow





Automate Mosaic Dataset Creation

Explore Imagery Properties

- **Look up raster data in your workspace**

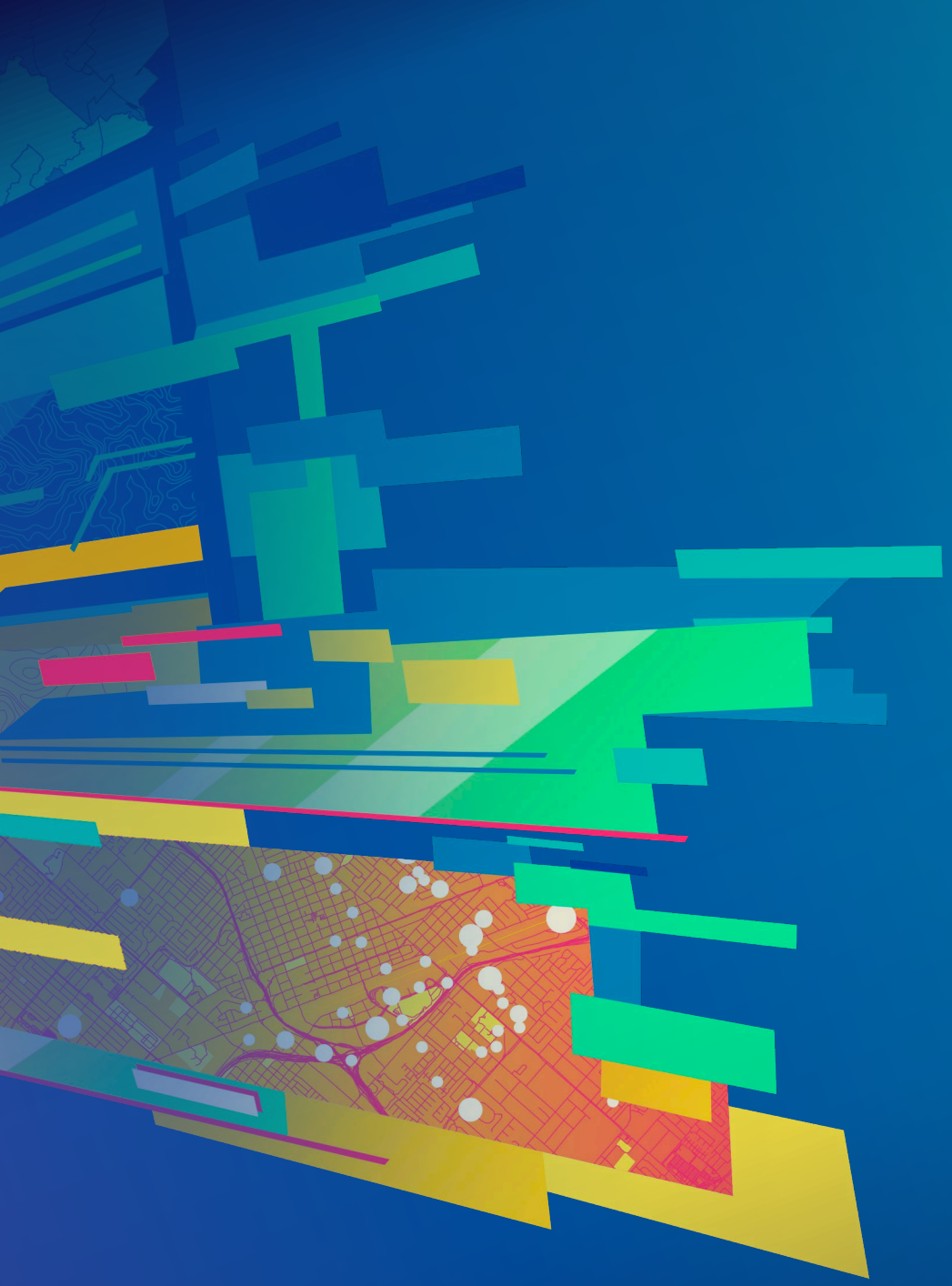
```
arcpy.env.workspace = workspace
rasterds = arcpy.ListRasters()
for raster in rasterds:
    yield os.path.join(workspace, raster)
```

- **Get raster property**

```
#get the sensorName property from the raster dataset
sensorNameResult = arcpy.GetRasterProperties_management(
    raster, "SENSORNAME")
```

- **Use correct raster type to load data into mosaic dataset**

```
# create mosaic dataset
arcpy.env.overwriteOutput = 1
arcpy.CreateMosaicDataset_management(gdbName, mdName, "54004")

# load data for this raster type
arcpy.AddRastersToMosaicDataset_management(
    os.path.join(gdbName, mdName), rasterType, indir)
```

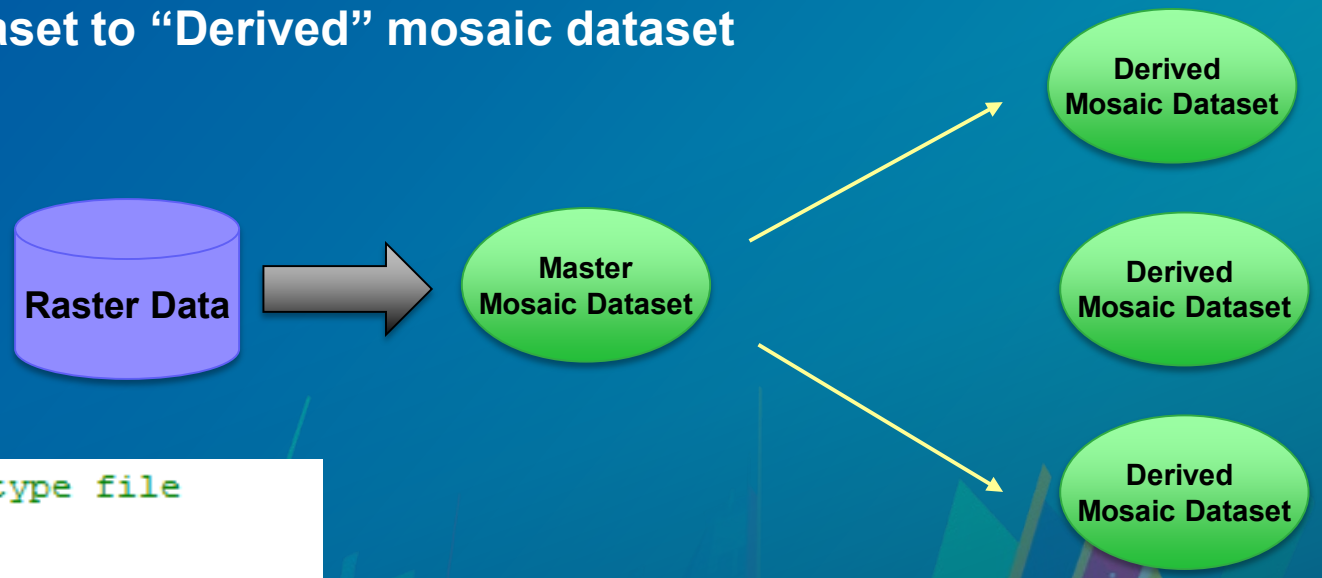


Demo

Image Discovery and Mosaic Dataset Creation

Create Derived Mosaic Dataset

- **Create subsets of your imagery collection for different projects**
  - **Use one “Master” mosaic dataset for all imagery data**
  - **Add subset of “Master” mosaic dataset to “Derived” mosaic dataset**



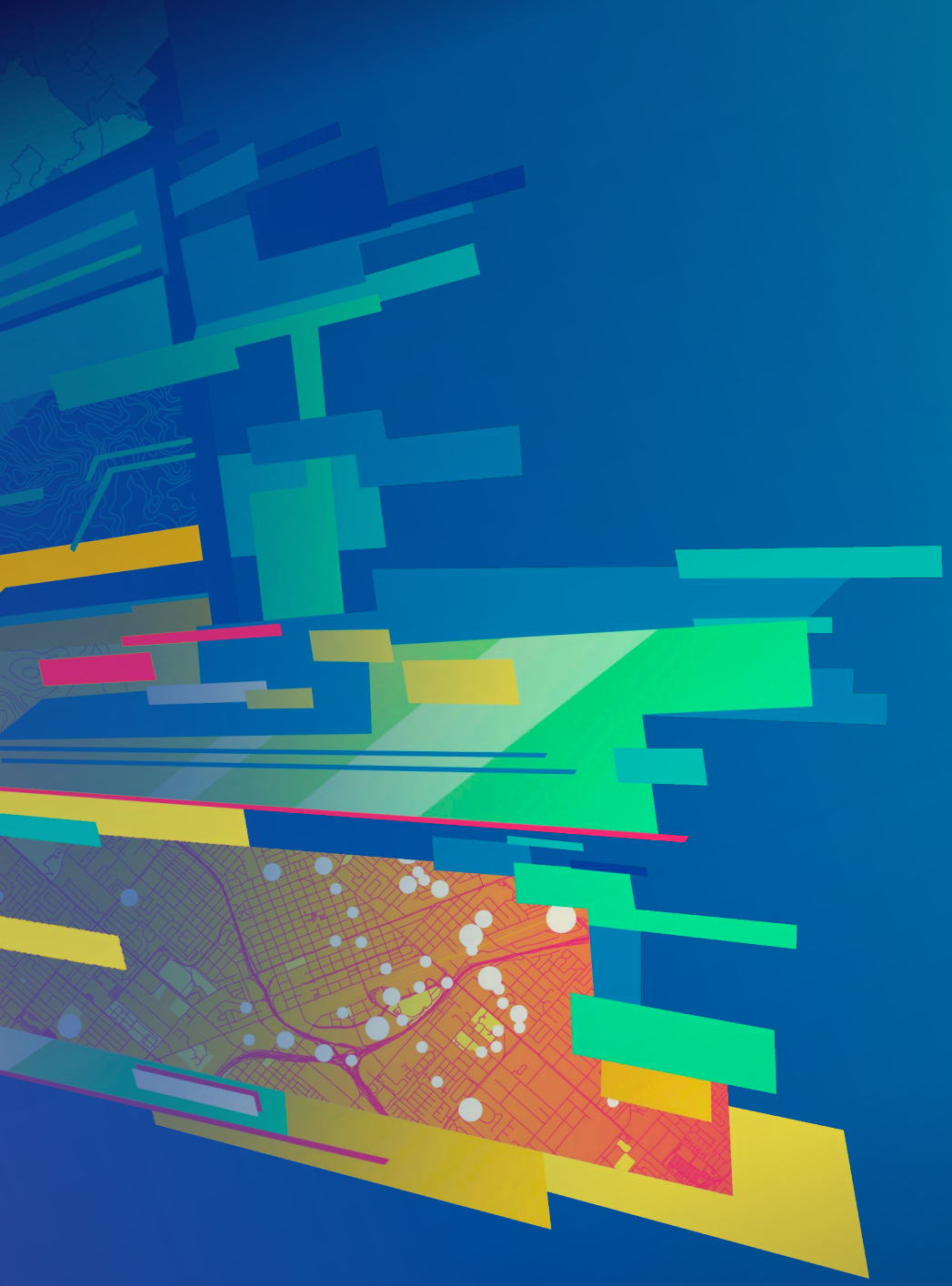

```
# Add rasters using the Table raster type file
# to create derived mosaic dataset
mdpath = os.path.join(
    arcpy.env.workspace, "FGDB.gdb/Geoeye1nIKONOS")
inputgeoeye = r"e:\MDGDB.gdb\sensorType2"
arcpy.AddRastersToMosaicDataset_management(
    mdpath, "Table", inputgeoeye)
```

Customize Mosaic Dataset

- **Customize raster type settings**
  - **Use Aux input parameter in “Add Rasters to Mosaic Dataset” tool**
  - **Edit raster type *art.xml file**
- **Use arcpy.da cursor to access mosaic dataset footprints table**
  - **Read raster object from Raster field**
  - **Read/write field values**

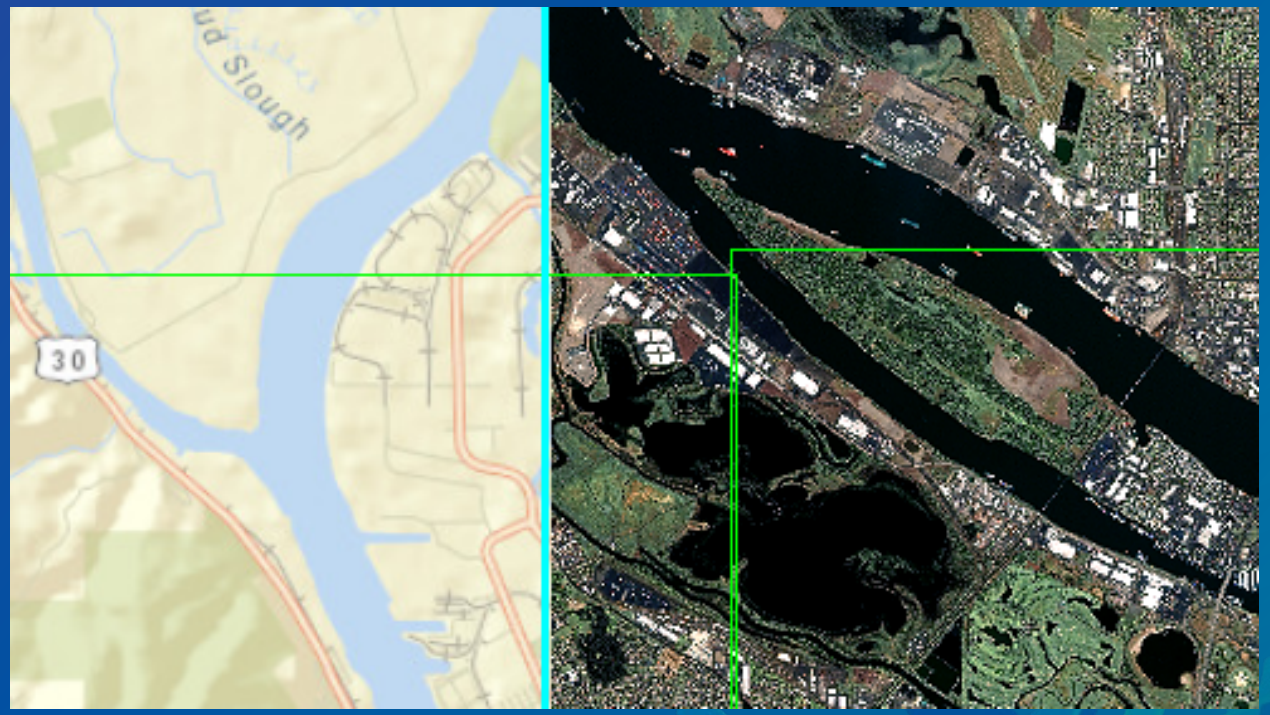
```
rasfields = ["OBJECTID", "Raster"]
with arcpy.da.SearchCursor(mdpath, rasfields) as rcursor:
    for row in rcursor:
        #Create Raster object directly from cursor
        bluemin = arcpy.GetRasterProperties_management(
            row[1], "WAVELENGTH", "BLUE")
```

- **Use Mosaic Dataset Geoprocessing tool set through arcpy**
  - **arcpy.AlterMosaicDatasetSchema_management()**
  - **arcpy.DefineOverviews_management()**
  - **....**



Demo

Creating Derived Mosaic Datasets



Automate Imagery Sharing

Automate image service sharing

- **Create publisher server connection file**

```
conType = "PUBLISH_GIS_SERVICES"
folderPath = os.path.join(os.getcwd(), "output")
fileName = serverName + "_publisher.ags"
serverURL = "http://"+serverName+":6080/arcgis"
serverType = "ARCGIS_SERVER"

arcpy.mapping.CreateGISServerConnectionFile(
    conType, folderPath, fileName, serverURL, serverType,
    username=userName, password=passWord)
```

- **Create image service definition draft**

```
sddraftPath = os.path.join(
    folderPath, serviceName+".sddraft")
arcpy.CreateImageSDDraft(
    mdPath, sddraftPath, serviceName, "ARCGIS_SERVER",
    copy_data_to_server=False)
```

Automate image service sharing

- **Modify service setting by editing *.sddraft file**
- **Analyze image service definition draft before publishing**

```
analysis = arcpy.mapping.AnalyzeForSD(sddraftPath)

for key in ('messages', 'warnings', 'errors'):
    print "----" + key.upper() + "---"
    vars = analysis[key]
    for ((message, code), data) in vars.iteritems():
        print "    ", message, " (CODE %i)" % code
```


```
  <OnServerName/>
- <Configurations xsi:type="typens:ArrayOfSVCConfiguration">
  - <SVCConfiguration xsi:type="typens:SVCConfiguration">
      <ID>63B5AEEC-4B1A-4CA4-B434-E1A631934596</ID>
      <Name>DS2019</Name>
      <TypeName>ImageServer</TypeName>
      <ResourceID>{05858694-F6F8-4CA6-BF50-B95F14B06EBC}</ResourceID>
      <ServiceFolder/>
      <DataFolder/>
    - <Definition xsi:type="typens:SVCConfigurationDefinition">
        <Description/>
      - <ConfigurationProperties xsi:type="typens:PropertySet">
        - <PropertyArray xsi:type="typens:ArrayOfPropertySetProperty">
            + <PropertySetProperty xsi:type="typens:PropertySetProperty">
            + <PropertySetProperty xsi:type="typens:PropertySetProperty">
            + <PropertySetProperty xsi:type="typens:PropertySetProperty">
            + <PropertySetProperty xsi:type="typens:PropertySetProperty">
            + <PropertySetProperty xsi:type="typens:PropertySetProperty">
            - <PropertySetProperty xsi:type="typens:PropertySetProperty">
                <Key>rasterTypes</Key>
                <Value xsi:type="xs:string">Raster Dataset</Value>
              </PropertySetProperty>
            - <PropertySetProperty xsi:type="typens:PropertySetProperty">
                <Key>rasterFunctions</Key>
                <Value xsi:type="xs:string">C:\DevSummit\DevSummit2019\Code\demo3\Portland_NDVI.rft.xml</Value>
              </PropertySetProperty>
            - <PropertySetProperty xsi:type="typens:PropertySetProperty">
                <Key>minInstances</Key>
                <Value xsi:type="xs:string">1</Value>
              </PropertySetProperty>
```

Automate image service sharing

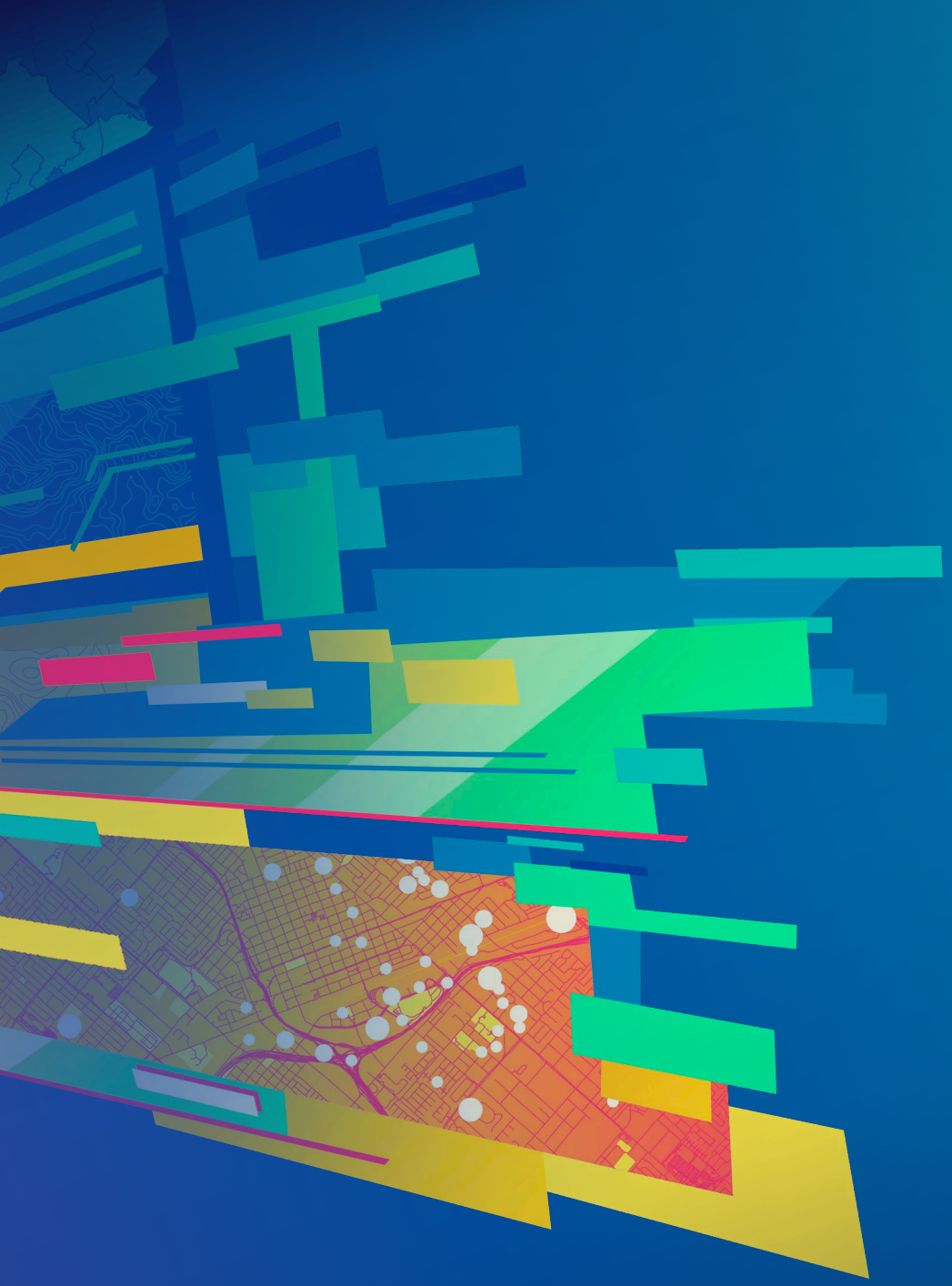
- **Stage *.sddraft to *.sd (Service Definition)**

```
sdPath = sddraftPath.replace(".sddraft", ".sd")
arcpy.StageService_server(sddraftPath, sdPath)
```

- **Upload service definition to server**

```
arcpy.UploadServiceDefinition_server(sdPath, connectionfile)
```

- **<u>Be aware of different publishing mode</u>**
  - **Publish image service by value – data will be copied**
  - **Publish by reference – data location needs to be registered as server data store**



Demo

Publishing Image Services

Use Image Service REST API in Python

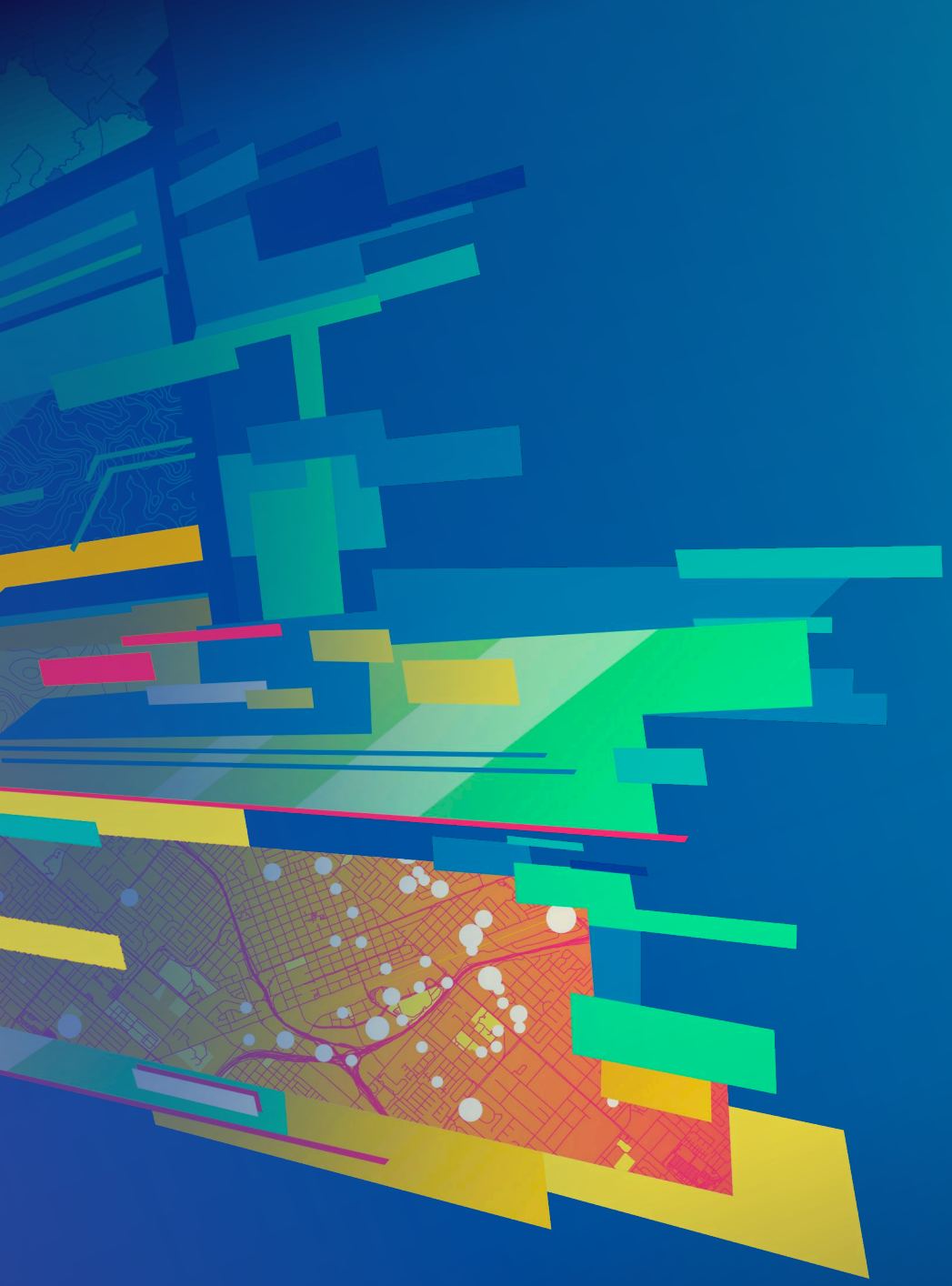
Image Service REST API

- Get general service information
- Query individual raster item
- Export Image
  - Define geometry
  - Define mosaic rule
    - LockRaster to export from specific item
  - Support compression
  - Request different rendering rules
  - Export format
- Many more… http://esriurl.com/isrest

Use Image Service REST API in Python

- **Python has many modules can be used for RESTful requests**
  - **requests (now comes with ArcGIS Python)**
  - **urllib2 etc.**
- **Example:**
  - **Custom Geoprocessing tool to clip and export**
  - **Make selection**
  - **Persist on-the-fly processing**
  - **Determine image order using mosaic rule**

```python
post_data = {
    "bbox": str(bbox).lstrip("[").rstrip("]"),
    "size": str(width) + "," + str(height),
    "imageSR": json.dumps(isprj),
    "bboxSR": json.dumps(isprj),
    "format": "tiff",
    "compression": "LZ77",
    "pixelType": pixtype,
    "mosaicRule": json.dumps({'mosaicMethod': 'esriMosaicLockRaster', 'lockRasterIds': [str(itemoid)]}),
    "renderingRule": json.dumps(rrule),
    "f": "json"
}

serviceURL = serviceURL.replace("arcgis/services", "arcgis/rest/services") + "/exportImage"

# arcpy.AddMessage("exportImage REST URL: {}".format(serviceURL))
# arcpy.AddMessage("exportImage REST parameters: {}".format(json.dumps(post_data)))
#Read response from server and find image url
arcpy.AddMessage("Requesting to export image id = " + str(itemoid))

req = requests.post(serviceURL, data=post_data, verify=False)

jsondict = req.json()
imageurl = jsondict["href"]

# arcpy.AddMessage("exportImage response: {}".format(json.dumps(jsondict)))
# Retrive image url from server
file_name = os.path.join(outputws, "mdimage" + str(itemoid) + ".tif")
if arcpy.Exists(file_name):
    arcpy.Delete_management(file_name)

with open(file_name, 'wb') as f:
    f.write(requests.post(imageurl).content)
arcpy.AddMessage("Successfully download image id = " + str(itemoid))
```



Demo

Clipping and Exporting Image Services

Thank you!

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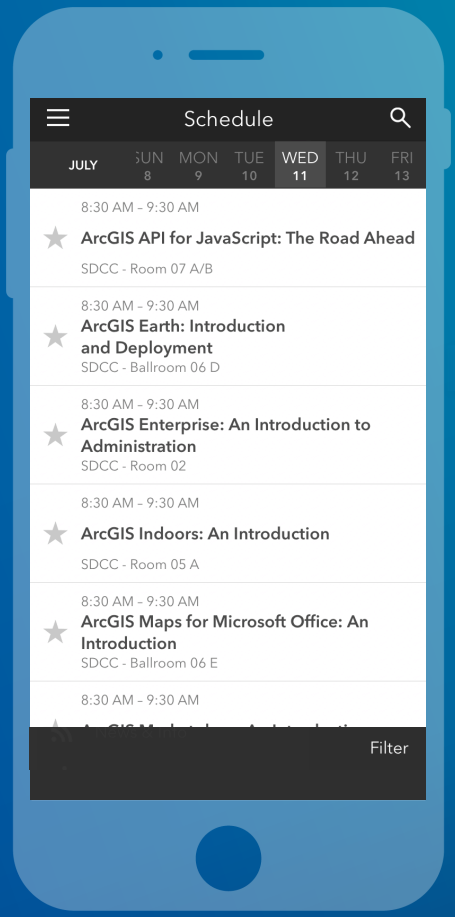
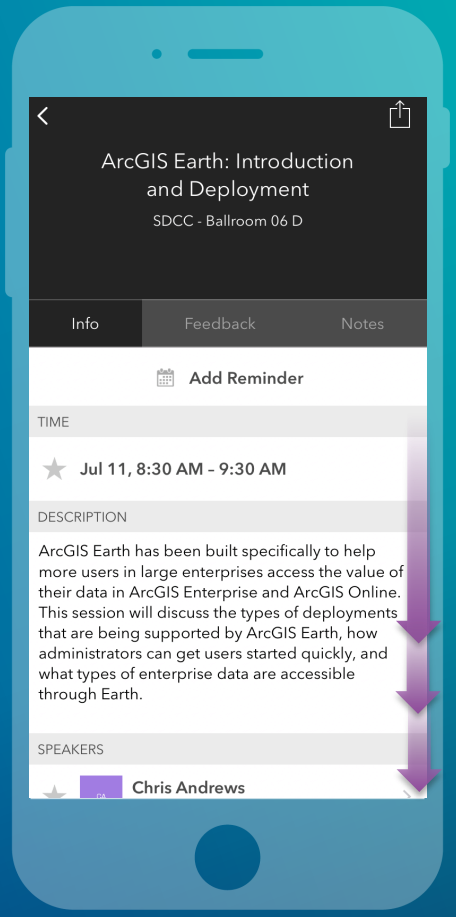


Scroll down to find the feedback section



Complete answers and select “Submit”